

DETAILED ACTION

Claim Objections

Claim 42 is objected to because of the following informalities:

Line 2, “connect” should be changed to –connected--.

Line 3, “connect” should be changed to –connected--.

Line 4, “form” should be changed to –from--.

Appropriate correction is required.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 2-13, 15-26 and 42 are rejected under 35 U.S.C. 103(a) as being unpatentable over Warner et al. (US 5957969) in view of Bouisse (US 2002/0145483 A1) in further view of Mody et al. (US 7226446 B1).

Regarding claim 2, Warner teaches a source of microwave radiation [20] having an output frequency; a probe [50] connected to said source, said probe being configured for directing said microwave radiation into said tissue to be ablated; a first detector [121, Fig. 1] which detects the magnitude of a reflected portion of the microwave radiation reflected back towards the source, the detector determining the magnitude of the reflected portion and an impedance adjuster [30] connected between said source of microwave radiation and said probe [Fig. 1], said impedance adjuster having an adjustable complex impedance. Warner teaches the

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importance of impedance matching in order to prevent a decline in performance from an increase in reflected power [col. 5, ll. 32-35], and teaches using the feedback of the detector for controlling the matching of impedances in order to minimize reflectance [col. 5, ll. 65-67, col. 6, ll. 1-16]. However, Warner fails to specifically teach detecting the phase of the reflected portion or use of a local oscillator. Bouisse teaches a system and method for impedance matching, and teaches that it is commonly known that both phase and magnitude information of a reflected portion of an emitted signal is detected and compared to a signal produced by a local oscillator [par. 0018] in order to identify an impedance mismatch so that the mismatch can be corrected via an impedance adjuster [par. 0039]. Therefore, it would have been obvious to one of ordinary skill in the art to use the system of detecting both phase and magnitude of the reflected portion of the signal as taught by Bouisse in order to identify an impedance mismatch in order to correct it. Warner further fails to specifically teach the output frequency being an output frequency in the range of 5-60 GHz. Mody teaches that it is commonly known that the frequencies for microwave energy for tissue ablation are in the range of approximately 800MHz to 6GHz [col. 3, ll. 58-62]. Therefore, it would have obvious to one of ordinary skill in the art to modify the range as taught by Warner to be within 5-60GHz, since the range is commonly known in the art to be optimal for microwave tissue ablation.

Regarding claim 3, Warner in view of Bouisse in view of Mody teaches a second detector [Warner, 121, Fig 1] for detecting the magnitude and phase of the forward directed microwave radiation directed from said source toward said probe, said second detector being connected to said local oscillator or a different local oscillator. Bouisse teaches that the phase and magnitude

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of the forward directed microwave radiation is detected in order to identify the impedance mismatch [par. 0035].

Regarding claim 4, Warner in view of Bouisse in view of Mody teaches the invention as claimed, but fails to specifically teach a third detector. It would have been obvious to one having ordinary skill in the art at the time the invention was made to add an additional detector for detecting the magnitude and phase of either the forward directed microwave radiation or reflected microwave radiation, to achieve the predictable result of more accurate detection, and since it has been held that mere duplication of the essential working parts of a device involves only routine skill in the art. *St. Regis Paper Co. v. Bemis Co.*, 193 USPQ 8.

Regarding claims 5 and 6, Bouisse teaches the detector comprises a mixer [56] for mixing the signal from the local oscillator with the reflected portion of said signal [par. 0018], a power sensor [50] and a phase comparator [57].

Regarding claim 7, Warner in view of Bouisse in view of Mody teaches the local oscillator is separate from the source of microwave radiation (e.g. the source is seen in Fig. 1 of Warner as 22, and the impedance matching circuit of Bouisse would take place of sensor 121, which is separate from the source).

Regarding claim 8, Warner in view of Bouisse in view of Mody teaches the local oscillator is connected to the source of radiation and configured to produce a signal derived from said source, but having a different frequency to the frequency of said source of microwave ablation [par. 0018].

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Regarding claim 9, Warner teaches a controller [35] for automatically adjusting said adjustable complex impedance of said impedance adjustor on the basis of the magnitude and phase of said radiation detected by said detector [col. 6, ll. 50-64].

Regarding claim 10, Warner teaches said controller [35] is configured to adjust said adjustable complex impedance dynamically in response to the variation in the magnitude and phase of said radiation detected by said detector [col. 6, ll. 50-64].

Regarding claim 11, Warner teaches said probe [50] is configured to penetrate biological tissue [col. 4, ll. 25-31].

Regarding claim 12, Warner teaches a separator [27, 28] for separating reflected microwave radiation from forward directed microwave radiation being directed towards said probe.

Regarding claim 13, Warner teaches said impedance adjuster is a stub tuner [col. 5, ll. 48-53].

Regarding claim 15, Warner teaches the probe is coaxial [col. 8, ll. 11-16].

Regarding claim 16, Warner teaches the probe is a waveguide [col. 8, ll. 11-16].

Regarding claim 17, Warner teaches the claimed invention except for the outer diameter of the probe being less than 1mm. Warner does teach that the diameter of the probe is capable of being adjusted to suit the needs of the particular system [col. 8, ll. 16-19]. It would have been obvious to one having ordinary skill in the art at the time the invention was made to make the diameter smaller than 1 mm for procedures which require smaller diameters, since it has been

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held that where the general conditions of a claim are disclosed in the prior art, discovering the optimum or workable ranges involves only routine skill in the art. *In re Aller*, 105 USPQ 233.

Regarding claim 18, Warner teaches the source of microwave radiation produces radiation of wavelength λ , and a radiation channeling means for conveying microwave radiation connects said impedance adjuster and said probe, said channeling means having an adjustable length whereby the combined length of said channeling means and said probe can be adjusted to be equal to a multiple of $\lambda/2$ [col. 9, ll. 1-14, col. 11, ll. 49-58].

Regarding claim 19, Warner teaches using a source of microwave radiation [20] to provide microwave radiation; placing a probe [50] in contact with or inserting a probe into biological tissue; directing said microwave radiation through said probe into the tissue to ablate the tissue [col. 4, ll. 25-31]; detecting the magnitude of microwave radiation reflected back through the probe by using a first detector [121], and adjusting the complex impedance of an impedance adjuster [30] connected between said source and said probe on the basis of the magnitude of the microwave radiation detected by said first detector [col. 6, ll. 11-15 and ll. 50-64]. Warner teaches the importance of impedance matching in order to prevent a decline in performance from an increase in reflected power [col. 5, ll. 32-35], and teaches using the feedback of the detector for controlling the matching of impedances in order to minimize reflectance [col. 5, ll. 65-67, col. 6, ll. 1-16]. However, Warner fails to specifically teach detecting the phase of the reflected portion or use of a local oscillator. Bouisse teaches a system and method for impedance matching, and teaches that it is commonly known that both phase and magnitude information of a reflected portion of an emitted signal is detected and compared to a signal produced by a local oscillator [par. 0018], which produces a signal having a frequency

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different than that of the emitted signal [par. 0018] in order to identify an impedance mismatch so that the mismatch can be corrected via an impedance adjuster [par. 0039]. Therefore, it would have been obvious to one of ordinary skill in the art to use the system of detecting both phase and magnitude of the reflected portion of the signal as taught by Bouisse in order to identify an impedance mismatch in order to correct it. Warner further fails to specifically teach the output frequency being an output frequency in the range of 5-60 GHz. Mody teaches that it is commonly known that the frequencies for microwave energy for tissue ablation are in the range of approximately 800MHz to 6GHz [col. 3, ll. 58-62]. Therefore, it would have obvious to one of ordinary skill in the art to modify the range as taught by Warner to be within 5-60GHz, since the range is commonly known in the art to be optimal for microwave tissue ablation.

Regarding claim 20, Warner teaches using a source of microwave radiation [20] to provide microwave radiation having a frequency; placing a probe [50] in contact with or inserting a probe into biological tissue; directing said microwave radiation from said source through an impedance adjuster [30] and then through said probe into said tissue to ablate the tissue; said impedance adjuster having an input connected to said source and an output connected to said probe [Fig. 1], said input and said output having respective complex impedances; detecting the magnitude of a reflected portion microwave radiation reflected back through said probe toward the source by using a first detector [121], said first detector used to determine the magnitude of said reflected radiation; and adjusting said complex impedance of said output of said impedance adjuster on the basis of said magnitude of said reflected microwave radiation detected by said first detector, so as to minimize the amount of microwave radiation which is reflected back through said probe [col. 6, ll. 50-64]. However, Warner fails to specifically teach

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detecting the phase of the reflected portion or use of a local oscillator. Bouisse teaches a system and method for impedance matching, and teaches that it is commonly known that both phase and magnitude information of a reflected portion of an emitted signal is detected and compared to a signal produced by a local oscillator [par. 0018], which produces a signal having a frequency different than that of the emitted signal [par. 0018] in order to identify an impedance mismatch so that the mismatch can be corrected via an impedance adjuster [par. 0039]. Therefore, it would have been obvious to one of ordinary skill in the art to use the system of detecting both phase and magnitude of the reflected portion of the signal as taught by Bouisse in order to identify an impedance mismatch in order to correct it. Warner further fails to specifically teach the output frequency being an output frequency in the range of 5-60 GHz. Mody teaches that it is commonly known that the frequencies for microwave energy for tissue ablation are in the range of approximately 800MHz to 6GHz [col. 3, ll. 58-62]. Therefore, it would have obvious to one of ordinary skill in the art to modify the range as taught by Warner to be within 5-60GHz, since the range is commonly known in the art to be optimal for microwave tissue ablation.

Regarding claims 21 and 22, Warner in view of Bouisse in view of Mody teaches the method as claimed but fails to specifically teach the probe is inserted into the tissue using microwave radiation to cut through the tissue so that an end of the probe is proximate to or inside a cancerous tumor in the tissue and microwave radiation is then passed through the probe to ablate said cancerous tumor. Warner does teach that the ablation catheter can be used for a wide variety of alternative applications [col. 15, ll. 16-20] and further that microwave ablation is commonly used to ablate tumors [col. 1, ll. 41-45]. Therefore, it would have been obvious to one

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of ordinary skill to use the invention as taught by Warner as a microwave ablation catheter for treating tumors since it is commonly known to use microwave ablation to treat cancer.

Regarding claim 23, Warner in view of Bouisse in view of Mody teaches the magnitude and phase of forward directed microwave radiation directed toward said probe from said source of microwave radiation is detected by using a second detector [Warner, 121, col. 4, ll. 58-64] and said local oscillator or a different local oscillator, and said adjustable complex impedance of said impedance adjuster is adjusted based on the signal magnitudes and phases detected by said first and second detectors.

Regarding claim 24, Warner teaches the invention as claimed, but fails to specifically teach a third detector. It would have been obvious to one having ordinary skill in the art at the time the invention was made to add an additional detector for detecting the magnitude and phase of either the forward directed microwave radiation or reflected microwave radiation, to achieve the predictable result of more accurate detection, and since it has been held that mere duplication of the essential working parts of a device involves only routine skill in the art. *St. Regis Paper Co. v. Bemis Co.*, 193 USPQ 8.

Regarding claim 25, Warner in view of Bouisse in view of Mody teaches said adjustable complex impedance of said impedance adjuster is adjusted automatically by a control means [Warner: 35] on the basis of said magnitude and phase detected by said detector so as to minimize the amount of microwave radiation reflected back through said probe [col. 6, ll. 50-64].

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Regarding claim 26, Warner in view of Bouisse in view of Mody teaches said impedance adjustment is carried out dynamically as the detected magnitude and phase varies [Warner: col. 6, ll. 50-64].

Regarding claim 42, Warner in view of Bouisse in view of Mody teaches an amplifier [Bouisse: 12] connected between the source and the probe, the amplifying system comprising a solid state power amplifier connected to receive an input thereof of the microwave radiation from the source [Bouisse: par. 0008].

Claims 40 and 41 are rejected under 35 U.S.C. 103(a) as being unpatentable over Warner in view of Bouisse in view of Mody, as applied to claim 2 above, in further view of Driscoll (US 5519359).

Regarding claim 40, Warner in view of Bouisse in view of Mody teach the invention as claimed, but fail to teach the source of microwave radiation is phase locked to a stable reference signal having a single frequency. Driscoll teaches a microwave oscillator system having a stable phase-locked oscillator frequency in order to improve the signal to noise ratio of the output [col. 1, ll. 18-19]. Therefore, it would have been obvious to one of ordinary skill in the art at the time of invention to phase lock the microwave radiation source to a stable reference signal having a single frequency as taught by Driscoll in order to improve the signal to noise ratio of the output.

Regarding claim 41, Warner/Bouisse/Mody/Driscoll teaches the source is tunable [via 30] so that its stable output frequency can be varied in a controlled manner.

Response to Arguments

Applicant's arguments with respect to the claims have been considered but are moot in view of the new ground(s) of rejection.

Newly cited references Bouisse and Mody have been applied to address applicant's new claim amendments.

Regarding applicant's argument that Warner fails to teach a stable output frequency because Warner teaches using a magnetron, it is submitted that the use of the magnetron does not preclude the device from having a stable output frequency. Furthermore, applicant's specification discloses that it is preferred to have a stable source of microwave radiation, but that any source of microwave radiation can be used [pg. 30, ll. 19-26]. There is also no specific teaching or explanation in applicant's specification which details why a magnetron would not be able to function as the source of microwave radiation. It is further noted that Warner teaches that any source of microwave radiation can be used [col. 4, ll. 55-56].

In response to applicant's argument that the references fail to show certain features of applicant's invention, it is noted that the features upon which applicant relies (i.e., a three stub tuner) are not recited in the rejected claim(s). Claim 13 only requires a stub tuner, which Warner teaches. Although the claims are interpreted in light of the specification, limitations from the specification are not read into the claims. See *In re Van Geuns*, 988 F.2d 1181, 26 USPQ2d 1057 (Fed. Cir. 1993).

Conclusion

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to VICTORIA W. CHEN whose telephone number is (571)272-3356. The examiner can normally be reached on M-F 8:30-5.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Linda Dvorak can be reached on (571) 272-4764. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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/Victoria W Chen/
Examiner, Art Unit 3739

/John P Leubecker/
Primary Examiner, AU 3739